-	
2	<u>Remarks</u>
3	Examiner Venhl is thanked for the thorough Office Action.
4	
5	
6	In the Specification
7	The specification has been reviewed and amendments made to correct
8	typographical and editorial errors. No new matter has been added.
9	In the Claims
10	A marked up version/copy of amended claims in attached at the back.
11	Claim objections and amendments
12	Claims 1, 11 and 19 are amended as kindly suggested by the examiner.
13	Claims 4, 12, 13 and 20, 21 are amended to delete "medium".
14	Note that all amendments to the claims are for clarification purposes and not
15	in response to prior art rejections.
16	Claims 2, 3, and 12 are canceled.
17	Claim 9 is amended to add the limitations of claim 4.
18	Claim 11 is added to clarify that the etch forms a first opening. See Fig 2 and
19	4.
20	Claim 14 is amended to depend from claim 11.
21	Claim 18 is amended to add the limitations of claim 13.
22	Claim 19 is added to clarify that the etch forms a first opening. See Fig 2 and
23	4.
24	Claim 26 is amended to correct a typo.
25	New claims 27 – 29 are added.
26	No new matter is added.

1			
2	CLAIM REJECTIONS:		
3			
4	Rejection Of Claims 1, 5, 6, 8 and 10 Under 35 U.S.C. § 102(e) as being anticipated by Ye		
5	et al. al. The rejection of claims 1, 5, 6 8 and 10 Under 35 U.S.C. § 102(e) as being		
7	anticipated by Ye et al. al. is acknowledged. Reconsideration and withdrawal of the rejection is		
8	respectfully requested in view of the amendments		
9	Amended claim 1 is non-obvious		
10	Amended claim 1, step (c)(1) limits the invention to a NH ₃ and CO or O ₂		
11	gasses.		
12	The Office Action dated 9/9/2002, posits that Ye suggest this. However, Ye		
13	teaches away from the claim 1 step c1's NH ₃ and CO or O ₂ etch gas by teaching (1) (See Ye,		
14	col. 12, line 20-21) a O_2 and N_2 alpha FC layer etch. Secondly, Ye teaches (2) a (See Ye col. 22,		
15	lines 41-42,) a NH ₃ only etch of FLARE TM low K layer. There is no suggestion to modify		
16	Ye's 2 separate etches/embodiments. Therefore Ye teaches away from amended claim 1 step C1.		
17			
18	Claims 5, 8 and 10 are non-obvious		
19	Claims 5, 8 and 10 are non-obvious over the cited art because they depend		
20	from non-obvious amended claim 1.		
21	Rejection of claims 11, 14, 15 and 17 under 35 U.S.C. § 102e as being anticipated by Ye et		
22	<u>al.</u>		
23	The rejection of claims 11, 14, 15 and 17 under 35 U.S.C. § 102e as being		
24	anticipated by Ye et al. is acknowledged. Reconsideration and withdrawal of the rejection is		
25	respectfully requested in view of the amendments.		
26	Amended parent Claim 11, step (c) claims etch gases of "NH ₃ and H ₂ etch		
27	gasses and flowing O ₂ or CO gasses. "		
28	The Office Action p. 4 cites Ye et al. in 2 instances (col. 12, L 20-21 and col.		
29	222, lines 41-42) as suggesting using claim 11's etch gases of NH ₃ and H ₂ etch gasses and		
30	flowing O2 or CO gasses. ". However, Ye teaches away from the claim 11 step c1's NH3 and		
31	H ₂ , and CO or O ₂ etch gas by teaching (1) (See Ye, col. 12, line 20-21) a O ₂ and N ₂ alpha FC		
32	layer etch. Secondly, Ye teaches (2) (See Ye col. 22, lines 41-42,) a NH ₃ only etch of FLARE		

l	TM low K layer. There is no suggestion to modify Ye's 2 separate etches/embodiments.		
2	Therefore Ye teaches away from amended claim 11 step C1.		
3			
4			
5	Claims 14 15 and 17		
6	Claims 14 15 and 17 depend from non-obvious amended claim 11.		
7			
8	Rejection of claims 2-4 and 12-13 under 35 U.S.C. § 103 as being unpatentable over Ye et		
9	al. and Bhardwag et al.		
10			
11	The rejection of claims 2-4 and 12-13 under 35 U.S.C. § 103 as being		
12	unpatentable over Ye et al. and Bhardwag et al. is acknowledged. Reconsideration and		
13	withdrawal of the rejection is respectfully requested in view of the amendments.		
14			
15	Claims 2 and 3 are canceled.		
16	Dependant Claim 4 contains specific result dependent parameters for the etch.		
17	These parameters are not suggested by the prior art. No other cited reference suggests that adding		
18	CO or O ₂ will reduce that polymer buildup and reduce sidewall bowing. See spec. p. 8, section		
19	D. Also, Claim 4 specifies a "medium plasma power" that is not suggested by the references.		
20	See Spec. p. 9 Section E.		
21			
22	Claim 12 is canceled.		
23	Dependent claim 13 is non-obvious.		
24	Dependent claim 13 is non-obvious. Dependant Claim 12 contains specific		
25	result dependent parameters for the etch. These parameters are not suggested by the prior art. No		
26	other cited reference suggests that adding CO or O2 will reduce that polymer buildup and reduce		
27	sidewall bowing. See spec. p. 8, section D. Also, Claim 13 specifies a "medium plasma power"		
28	that is not suggested by the references. See Spec. p. 9 Section E.		
29			
30			
31	Rejection of claims 7 and 16		

1	Claims 7 and 16 depend from non-obvious parent claims as discussed above.		
2	Rejection of claims 9 and 18		
3	Amended claims 9 and 18 are non-obvious for the reasons discussed above for		
4	their respective parent claims. Moreover, claim 9 and 18 claim the exact process that create		
5	straight walled openings.		
6			
7 8 9	Rejection of claims 19 22-24 and 25 under 35 U.S.C. § 103a as being unpatentable voer Ye and Ngo		
10	The rejection of claims 19 22-24 and 25 under 35 U.S.C. § 103a as being		
11	unpatentable over Ye and Ngo is acknowledged. Reconsideration and withdrawal of the rejection		
12	is respectfully requested in view of the amendments.		
13			
14	Parent claim 19 step c1, claims an etch with only NH ₃ and N ₂ etch gasses.		
15			
16	The combination of Ye et al. and Ngo et al. is improper.		
17	The combination of Ye et al. and Ngo et al. is improper for the purpose cited		
18	in the Office Action because neither reference suggests they be combined and this can be only		
19	done by hindsight.		
20	Even if combined Ye and Ngo do not met claim 19.		
21	Even if combined Ye and Ngo do not met claim 19 step c1. Yu col 22, lines		
22	39 to 42 teaches a NH ₃ only etch. This teaches away from claim 19's only NH ₃ and N ₂ etch		
23	gasses.		
24	In contrast to amended claim 19's "etch process to etch said organic low k		
25	dielectric layer through said opening to form a first opening using said masking pattern as an		
26	etch mask; Ngo col. 4, lines 40-42 does not form a first opening. In contrast, Ngo only perform		
27	a "plasma treatment" See col. 4, lins 40 to 49; See col. 4, lines 5 -20. Ngo is a different step,		
28	previous step, forms an opening. See Ngo col. 5, lines 37 – 40.		
29	Therefore, it is improper to cite Ngo as an etch step. Furthermore, Ngo does		
30	not met or suggest claim 19's etch step or chemistry.		
31			

1	Rejection of claims 20-21		
2			
3	The rejection of claims 20-21 is acknowledged. Claim 20 depends from non-		
4	obvious parent claim 19 as discussed above. Claim 20 claims non-obvious parameters.		
5	Claim 21 contains non-obvious parameters.		
6	Combination of Ye and Bhardwaj is improper.		
7	The combination of Ye and Bhardwaj is improper. The combination of Ye		
8	and Bhardwai can only be done by hindsight. There is no suggestion to combine the references.		
9	The references teach incompatible processes and teach away from each other. The point		
10	Bhardwai is cited for, increasing the etch rate by varying every process parameter, is not		
11	related to the invention's object to increase the etch rate and straightness of the vertical walls of		
12	the opening. See spec. p. 12 lines 12 and claim 9.		
13	Therefore, claims 20-21 are non-obvious.		
14	Rejection of claim 26		
15	Rejection of claim 26 is acknowledged. Reconsideration and withdrawal of		
16	the rejection is respectfully requested in view of the amendments.		
17	Claim 26 depends form a non-obvious parent claim and is non-obvious.		
18			
19	Furthermore, the combination of reference is improper because there is no-		
20	motivation to combine than and they can only be combined by hindsight. Moreover,		
21	McReynolds teaches a total unrelated etch process of different material, different gases and		
22	different results.		
23			
24			
25	New claims 27 and 28 are non-obvious		
26	New claims 27 and 28 claim and etch with flowing NH ₃ and N ₂ etch gasses		
27	and flowing CO or O ₂ gasses. These are non-obvious for the reasons stated above.		
28			
29			
30			

1	
2	CONCLUSION
3	In conclusion, reconsideration and withdrawal of the rejections are
4	respectfully requested. Allowance of all claims is requested. Issuance of the application is
5	requested.
6	It is requested that the Examiner telephone the undersigned attorney George
7	Saile at (845) 452-5863 should there be anyway that we could help to place this Application in
8	condition for Allowance.
9	Respectfulty submitted,
10	
11	07.75
12	Stephen B. Ackerman
13	Reg. No. 37,761
14	

1 2	Version with markings to show changes Claims with amendments are shown marked up to shown amendments.		
3	Claims not amended are not marked up.		
4			
5	1. (Amended) A method of fabrication of etching a low -k dielectric layer used in		
6	microelectronics fabrication; comprising the steps of:		
7	a) forming an organic low k dielectric layer over a substrate;		
8	b) forming a masking pattern over said organic low k dielectric layer; said		
9	masking pattern having an opening;		
10	c) using an etch process to etch said organic low k dielectric layer through said		
11	opening to form a first opening using said resist pattern as an etch mask; said etch		
12	process comprising:		
13	(1) in a first step, etching said organic low k dielectric layer by applying a plasma		
14	power and flowing at least NH ₃ gas and flowing CO or O ₂ gasses.		
15	cancel claim 2		
16			
17	Cancel claim 3		
18	4. (Amended) The method of claim 1 wherein said first step comprises applying a [medium]		
19	plasma power plasma density between 1E9 and 1E11 cm ⁻³ and flowing [only] NH ₃ gas, a		
20	power in between 500 and 1500 W, and a NH ₃ flow between 50 and 300 sccm and a pressure		
21	between 80 and 800 mTorr and flowing CO or O2 gasses.		
22	5. The method of claim 1 wherein said organic low k dielectric is comprised of a material		
23	selected from the group consisting of fluorinated arylether, Benzocyclobuthene (BCB),		
24	amorphous teflon, carbon doped oxides, poly arylene ether (PAE) and organic Spin on		
25	materials.		
26	6. The method of claim 1 wherein said organic low k dielectric is comprised of a material		
27	selected from the group consisting of fluorinated arylether, and poly arylene ether.		
28	7. The method of claim 1 wherein said organic low k dielectric is comprised of carbon doped		
29	oxide.		
30	8. The method of claim 1 wherein said organic low k dielectric is comprised of poly arylene		
31	ether (PAE).		

1	9. (Amended) The method of claim 1 wherein said etch forms [a] said first opening through said		
2	organic low k dielectric layer; said first opening having sidewalls defined by said organic low		
3	k dielectric layer; said sidewalls are substantially vertical at a angle between 87 and 93		
4	degrees to the surface of the substrate; and said first step comprises applying a [medium]		
5	plasma power plasma density between 1E9 and 1E11 cm ⁻³ and flowing NH ₃ gas, a power in		
6	between 500 and 1500 W, and a NH ₃ flow between 50 and 300 sccm and a pressure between		
7	80 and 800 mTorr and flowing CO or O ₂ gasses.		
8			
9	10. The method of Claim 1 wherein the substrate is selected from the group consisting of:		
10	microelectronics conductor materials; microelectronics semiconductor materials; and		
11	microelectronics dielectric materials.		
12 13	11. (AMENDED) A method of fabrication of etching a low -k dielectric layer, comprising the		
14	steps of:		
15	a) forming an organic low k dielectric layer over an insulation layer over a		
16	substrate;		
17	b) forming a masking pattern over said organic low k dielectric layer; said		
18	masking pattern having an opening;		
19	c) using an etch process to etch said organic low k dielectric layer through said		
20	opening to form a first opening using said masking pattern as an etch mask; said etch		
21	process comprising:		
22	(1) in a first step, etching said organic low k dielectric layer by applying a plasma		
23	power and flowing NH_3 and H_2 etch gasses and flowing O_2 or CO gasses.		
24			
25	cancel claim 12		
26			
27	13. (Amended) The method of claim 11 wherein said first step comprises:		
28	a plasma power between 500 and 1500 W, [medium] plasma power plasma		
29	density between 1E9 and 1E11 cm ⁻³ , a NH ₃ flow between 50 and 300 sccm, a H ₂ flow between		
30	50 and 300 sccm and a pressure between 80 and 800 mTorr and flowing O ₂ or CO gasses.		

1	14. (Amended) The method of claim [1] 11 wherein said organic low k dielectric is comprised		
2	of a material selected from the group consisting of fluorinated arylether, Benzocyclobuthene		
3	(BCB), amorphous teflon, carbon doped oxides, poly arylene ether (PAE) and organic Spin or		
4	materials.		
5	15. The method of claim 11 wherein said organic low k dielectric is comprised of a material		
6	selected from the group consisting of fluorinated arylether, and poly arylene ether.		
7	16. The method of claim 11 wherein said organic low k dielectric is comprised of carbon doped		
8	oxide.		
9	17. The method of claim 11 wherein said organic low k dielectric is comprised of poly arylene		
10	ether (PAE).		
11	18. (Amended) The method of claim 11 wherein said etch forms [a] said first opening through		
12	said organic low k dielectric layer; said first opening having sidewalls defined by said organic		
13	low k dielectric layer; said sidewalls are substantially vertical at a angle between 87 and 93		
14	degrees to the surface of the substrate; and said first step comprises:		
15	a plasma power between 500 and 1500 W, plasma power plasma density		
16	between 1E9 and 1E11 cm ⁻³ , a NH ₃ flow between 50 and 300 sccm, a H ₂ flow between 50 and		
17	300 sccm and a pressure between 80 and 800 mTorr and flowing O ₂ or CO gasses.		
18	19. (Amended) A method of fabrication of etching a low -k dielectric layer; comprising the		
19	steps of:		
20	a) forming an organic low k dielectric layer over a insulation layer over a		
21	' substrate;		
22	b) forming a masking pattern over said organic low k dielectric layer; said		
23	masking pattern having an opening;		
24	c) using an etch process to etch said organic low k dielectric layer through said		
25	opening to form a first opening using said masking pattern as an etch mask; said etch		
26	process comprising:		
27	(1) in a first stan, atching said argania law k dialoctric layor by applying a plasma		
28	(1) in a first step, etching said organic low k dielectric layer by applying a plasma		
20	power and flowing only NH_3 and N_2 etch gasses.		

l	20. (Amended) The method of claim 19 wherein said first step comprises:			
2	power in between 500 and 1500 W, [medium] plasma power plasma density			
3	between 1E9 and 1E11 cm ⁻³ , a NH ₃ flow between 50 and 300 sccm and a N ₂ flow between 50			
4	and 300 sccm and a pressure between 80 and 800 mTorr.			
5	21. (Amended) The method of claim 19 wherein said first step comprises:			
6	power in between 500 and 1500 W, [medium] plasma power plasma density			
7	between 1E9 and 1E11 cm ⁻³ , a NH ₃ flow between 50 and 300 sccm and a N ₂ flow between 50			
8	and 300 sccm and a pressure between 80 and 800 mTorr and flowing CO or O2 gasses.			
9				
10	22. The method of claim 19 wherein said organic low k dielectric is comprised of a material			
11	selected from the group consisting of fluorinated arylether, Benzocyclobuthene (BCB),			
12	amorphous teflon, carbon doped oxides, poly arylene ether (PAE) and organic Spin on			
13	materials.			
14	23. The method of claim 19 wherein said organic low k dielectric is comprised of a material			
15	selected from the group consisting of fluorinated arylether, and poly arylene ether.			
16	24. The method of claim 19 wherein said organic low k dielectric is comprised of carbon doped			
17	oxide.			
18	25. The method of claim 19 wherein said organic low k dielectric is comprised of poly arylene			
19	ether (PAE).			
20	26. (Amended) The method of claim 19 wherein said etch forms [an] said first opening			
21	through said organic low k dielectric layer; said first opening having sidewalls defined by said			
22	organic low k dielectric layer; said sidewalls are substantially vertical at a angle between 87			
23	and 93 degrees to the surface of the substrate.			
24				
25	Please add new claims as follows			
26	A method of fabrication of etching a low -k dielectric layer; comprising the steps of:			
27	a) forming an organic low k dielectric layer over a insulation layer over a			
28	substrate; said organic low k dielectric is comprised of a material selected from the			
29	group consisting of fluorinated arylether, Benzocyclobuthene, amorphous teflon,			
30	carbon doped oxides, and organic Spin on materials.			

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1	b)	forming a masking pattern over said organic low k dielectric layer; said		
2	m	asking pattern having an opening;		
3	c)	using an etch process to etch said organic low k dielectric layer through said		
4	oŗ	pening to form a first opening_using said masking pattern as an etch mask; said etch		
5	pr	ocess comprising:		
6		(1) in a first step, etching said organic low k dielectric layer by applying a plasma		
7	power and flowing NH3 and N2 etch gasses and flowing CO or O2 gasses			
8				
9	28. The meth	od of claim 27 wherein said first step comprises:		
10		power in between 500 and 1500 W, plasma power plasma density between		
11	1E9 and 1E11	cm ⁻³ , a NH ₃ flow between 50 and 300 sccm and a N ₂ flow between 50 and 300		
12	sccm and a pressure between 80 and 800 mTorr and flowing CO or O ₂ gasses.			
13	29. The method of claim 27 wherein said first step comprises:			
14		power in between 500 and 1500 W, plasma power plasma density between		
15	1E9 and 1E11	$\mbox{cm}^{\mbox{-}3}, \mbox{a NH}_3 \;\; \mbox{flow between 50 and 300 sccm and a N_2 } \; \mbox{flow between 50 and 300}$		
16	scem and a pro	essure between 80 and 800 mTorr and flowing CO or O ₂ gasses; and		
17		said etch forms said first opening through said organic low k dielectric layer;		
18	said first open	ing having sidewalls defined by said organic low k dielectric layer; said sidewalls		
19	are substantial	ly vertical at a angle between 87 and 93 degrees to the surface of the substrate.		
20				